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COMPARISON OF ATMOSPHERIC AEROSOL VOLATILITY AT A SUBURBAN AND RURAL MEASUREMENT SITE

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INTRODUCTION

One of the most important characteristics of atmospheric aerosols is their volatility. Volatility affects the formation, life time, and removal of aerosol particles (Huffman et al., 2009). Accurate description of volatility of atmospheric aerosols can lead to a better identification of their sources and it is also crucial for models incorporating condensation and aging of aerosols (Wu et al., 2009; Zhao et al., 2016). However, there is still a lack of knowledge regarding aerosol properties such as volatility especially in case of organic aerosols (Lee et al., 2010).

To increase our understanding of aerosols volatility, we have performed summer (21.8.-2.10.2012; 17.6.-18.8.2014) and winter (19.2.-28.5.2013; 9.1.-13.3.2014) measurement campaigns with a thermodenuder at a suburban site in Prague Suchdol and at a rural site Košetice, respectively.

EXPERIMENTAL SETUP

The following instruments were deployed during the summer and winter measurement campaigns with a thermodenuder: Compact Time-Of-Flight Aerosol Mass Spectrometer (C-ToF-AMS), Scanning Mobility Particle Sizer (SMPS), Filter Measurement Analyzed by Ion Chromatography (IC).

The collection efficiencies for the non-thermodenuded sample measured by the AMS during particular campaigns were determined by comparison of sulphate concentrations measured by the AMS and chemical analyses of PM1 filter samples taken in parallel. The resulting values are following: Suchdol Summer (PS) 0.36, Suchdol Winter (PW) 0.33, Košetice Summer (KS) 0.25*, Košetice Winter (KW) 0.14*.
* Uncorrected for sample dilution.

RESULTS

Figure 1 shows the ratio of thermodenuded and non-thermodenuded samples for particular campaigns. Sulphate was the least volatile compound during all campaigns, followed by ammonnium, chloride, organics and nitrate - the most volatile compounds. The relatively lower volatility of nitrate in summer compared to winter is caused by higher average temperatures in summer leading to its evaporation prior to entering the sampling head. We have also studied the volatility in relationship to the origin of relevant air masses.

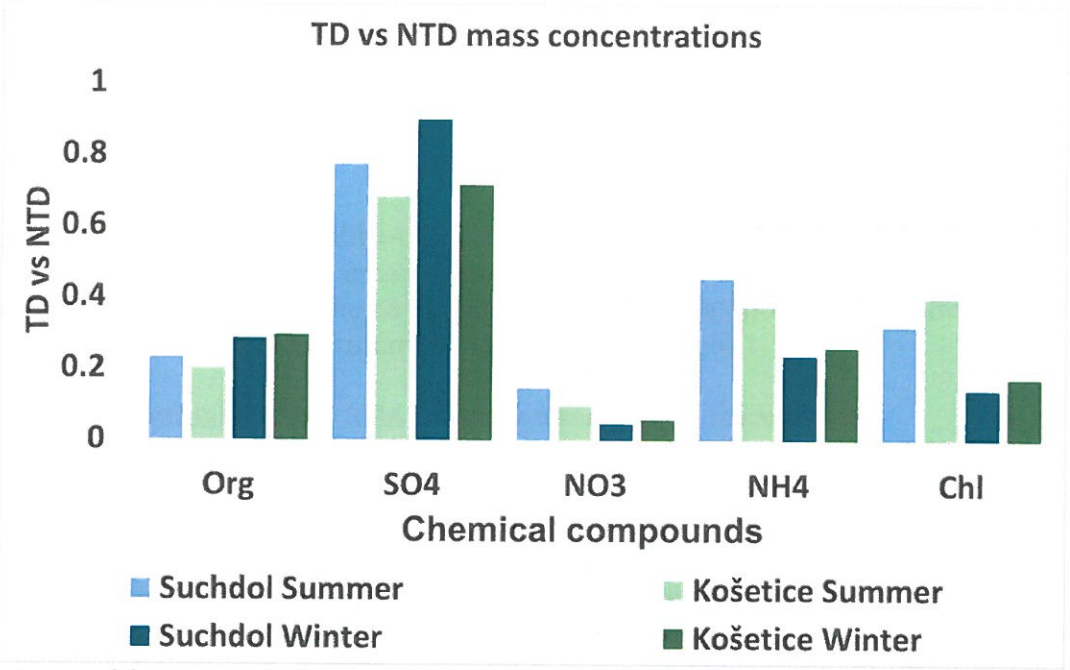

Fig. 1: Ratio of thermodenuded and non-thermodenuded mass concentrations measured by the AMS during particular campaigns

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